REMARKS

Claims 1 and 3 remain for consideration in this application.

Claims 1 and 3 are rejected under 35 U.S.C. §103(a) as being unpatentable over Amstutz (USP 4,634,229) in view of Natsunaga (USP 5,548,423) (hereinafter referred to as Matsunaga, which is the correct spelling his name, Mr. Matsunaga also being one of the inventors of the instant application).

In view of the remarks in the Office Action, it is submitted that even a combination of Amstutz and Matsunaga does not suggest the instant invention as set forth in claims 1 and 3. More specifically, the Office Action, in the section entitled "Response to Arguments", does not fully make the case that the features of claims 1 and 3 are shown by the cited references. Accordingly, the arguments set forth below are based upon specific remarks of the applicants, clearly documenting and distinguishing the claimed invention from the two cited references.

The Office Action still takes the position that ß + γ is a crossed angle in the vibration directions of the polarizers. We will focus this discussion on the Amstutz reference. Attached hereto is a copy of Fig. 4 of Amstutz (Exhibit 1) with the pertinent parts labeled. In Fig. 4 of Amstutz, reference numerals 10, 11 are polarizers, reference numerals 8, 9 are orientation layers, and reference numeral 5 is a liquid crystal layer.

It is important to first understand what ß and γ represent in Amstutz. In Fig. 4, an orientation direction of the orientation layer 8 is shown by an arrow with a solid line, and the arrow is shown with a dashed line in the polarizer 10 while keeping the same direction. Similarly, an orientation direction of the orientation layer 9 is shown by an arrow with a solid line, and the arrow is shown with a dashed line in the polarizer 11 while keeping the same direction.

The vibration directions of polarizers 10, 11 are shown by arrows with a solid line having arrowheads on both ends. This is clear from column 4, line 62 to column 5, line 8, as follows:

> Figs. 4 and 5 show exploded, perspective representations of the arrangement of the polarizers 10 and 11, the orientation layers 8 and 9 as well as the liquid crystal layer 5 located between these layers. The total twist ϕ of the liquid crystal in the layer is made clear by a chain of liquid crystal molecules which are schematically represented by small rectangular platelets. Support plates, border and possible reflectors have been left out for sake of clarity. The elements of the cell are arranged along an axis pointing along the propagation direction of the incident light. The direction of vibration of the polarizers 10 and 11 as well as the orientation direction of the orientation layers 8 and 9 are also indicated by arrows which lie in the corresponding planes perpendicular to the above-mentioned axis of the cell.

Fig. 4 shows that the vibration direction of the polarizer 10 and the orientation direction of the orientation layer 8 have an angle of ß, and similarly the vibration direction of the polarizer 11 and the orientation direction of the orientation layer 9 have an angle of γ. This is clear from column 5, lines 17-20:

> The vibration directions of the polarizers 10 and 11 are rotated from the orientation directions of the orientation layers 8 and 9, represented by the dashed lines in the polarizers planes, by the angles β and γ.

It is clear so far that, in Amstutz, ß and γ are only angles formed of the vibration directions of the polarizers and the orientation directions of the liquid crystal layers.

We will then review what determines the crossed angles of the vibration directions of the polarizers 10, 11. Amstutz teaches that the best contrast ratio is always achieved by $ß + \gamma = \pm 90°$ or $ß + \gamma = 0°$. This is clear from column 6, lines 48-60 as suggested by the Examiner. Consequently,

when a twisted angle ϕ of liquid crystal molecules changes while maintaining a condition of $\beta + \gamma = \pm 90°$ or $\beta + \gamma = 0°$, the vibration directions of the polarizers 10, 11 change. In Amstutz, a twisted angle ϕ of liquid crystal molecules is greater than 180°and less than 360° and therefore the crossed angles of the vibration directions of the polarizers 10, 11 change within the range of the twisted angle.

In response to the last Office Action, we noted that the relationship between β, γ, and ϕ, and the crossed angle of the vibration directions of the polarizers (Ψ) in the inventor's comments, (Exhibit 1 as filed), is $\psi = | \beta - \gamma | + \phi$. In the example of Amstutz, Ψ unintentionally became 90° because a twisted angle of liquid crystal molecules was 270°. However, the twisted angle 270° is out of the range indicated in the present invention which is greater than 180°and less than 260°. The crossed angle of the vibration directions of the polarizers 10, 11 will not be 90° by the twisted angle in the range disclosed in the present invention.

Only the example of twisted angle 270° in Amstutz was shown in our response to the last Office Action. We would like to add a modified example of Amstutz with a twisted angle of 240° as illustrated in the table of Exhibit 2.

As seen from the new table (Exhibit 2), a range of the twisted angle in the present invention, i.e., greater than 180° and less than 260°, cannot allow a crossed angle of the vibration directions of the polarizers 10, 11 in Amstutz to be 90° because Amstutz maintains $\beta + \gamma = 90°$. Thus, even the modified example of Amstutz does not satisfy the claim limitations.

Clearly, Matsunaga does not disclose any of the features described above.

Furthermore, the differences described above can also be illustrated in view of a claim chart

attached hereto as Exhibit 3. In the claim chart, pertinent portions of claim 1 are set forth on the left side, in the first column. The second column is the disclosure of Amstutz, and the third column is the modified example of Amstutz (as illustrated in Exhibit 2) in which the twisted angle is 240 °. In considering Exhibit 3, it is clear that Amstutz does not disclose nor suggest the features recited in claim 1. Exhibit 3 does not consider the Matsunaga disclosure, it is only directed to what Amstutz does and does not show. Specifically, as noted in the claim chart of Exhibit 3, the twisted angle of Amstutz is illustrated as 270°, which is outside of the required range of claim 1. While the absorption axes of the polarizing plates are orthogonal to one another, the absorption axes compared to the relative direction "in which intermediate liquid crystal molecules are oriented" are 0 and 90°, and not the required $\pm$40° to $\pm$50°. Thus, since at least 2 elements are out of range, the disclosure of Amstutz is significantly different than the requirements of claim 1. Therefore, even when considered with Matsunaga, that combination does not suggest the invention cited in claims 1 or 3.

On the other hand, as illustrated in the claim chart of Exhibit 3, the modified example of Amstutz is set forth where the twisted angle is 240° . In such a case, the absorption axes of the polarizing plates are no longer orthogonal to one another, but have an angle of 60°. Furthermore, the angle between the absorption axes of the polarizing plates and the "intermediate liquid crystal molecules" is 15° and 75°, which also is not within the range of $\pm$40° and $\pm$50°. Accordingly, even the modified example of Amstutz, in which the twisted angle is changed to be within the range of claim 1, the angle between absorption axes of the polarizing plates and the angle between the absorption axes of the polarizing plates and the "intermediate liquid crystal molecules" do not fall

within the claimed range. Accordingly, since at least 2 elements are out of range, even when Amstutz is combined with Matsunaga, there is no disclosure, nor suggestion of the invention set forth in claims 1 and 3. Accordingly, it is respectfully requested that the rejection of the claims in this application be withdrawn.

In view of the remarks above distinguishing the claimed invention from the cited prior art references, applicants respectfully request that the rejection be withdrawn and that the claims be allowed.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 50-2866.

Respectfully submitted,

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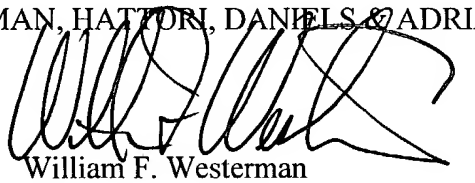

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FIG. 4

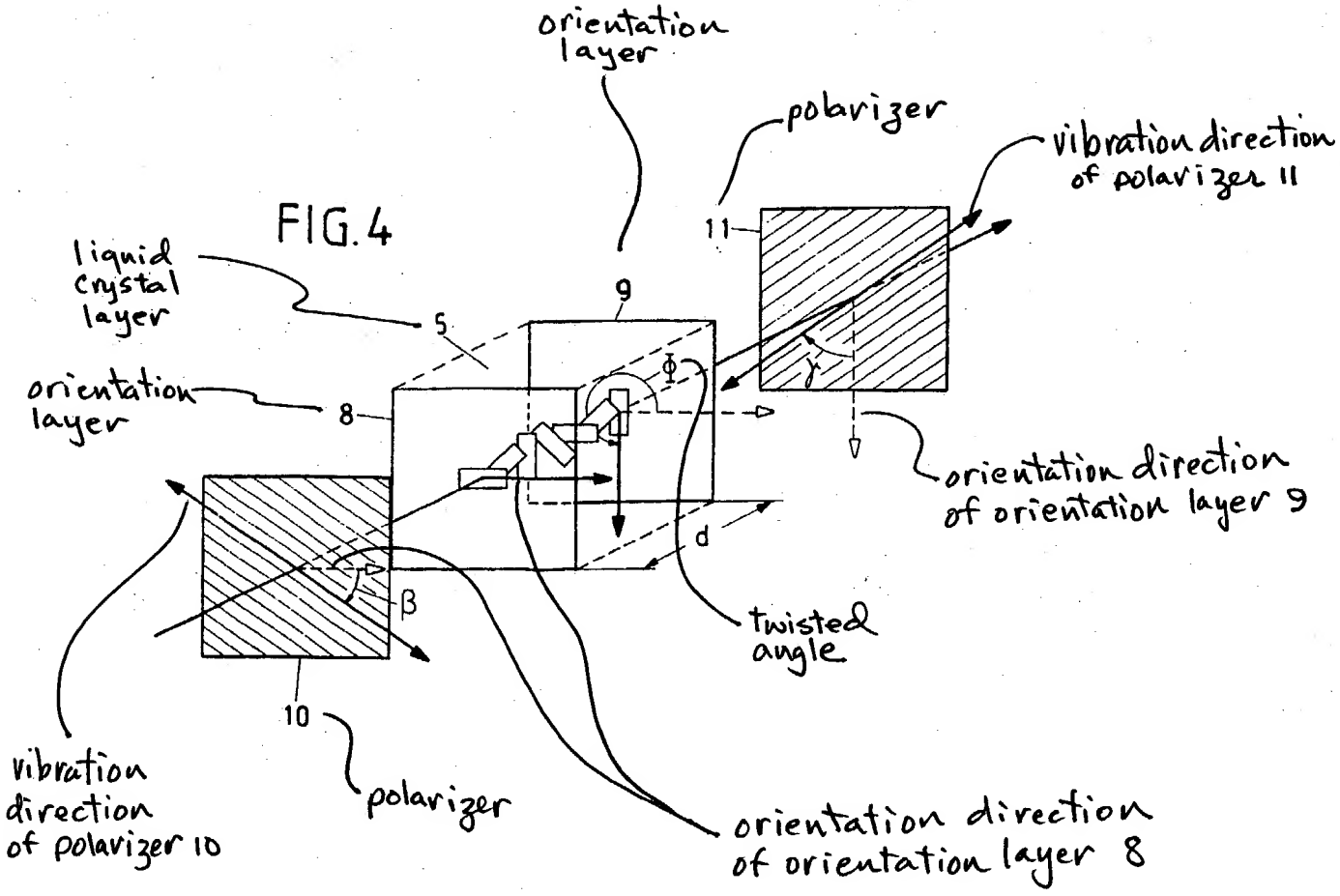

EXHIBIT 1

	ϕ	Ψ	P1	P2	γ	β	$\gamma+\beta$
Example of Present Invention	240	90	-45	+45	105/15	75/-15	0
Example of Reference 1	270	90	0	90	45	45	90
Modified Example of Reference 1	240	60	15	75	45	45	90

EXHIBIT 2

CLAIM CHART

Claim 1	Amstutz	Modified Amstutz
A liquid crystal shutter comprising:	A liquid crystal display	A liquid crystal display
. . .		
said liquid crystal device having a twisted angle of greater than 180° and less than or equal to 260°; and	270° (not within range)	240°
a pair of polarizing plates between which are sandwiched said first transparent substrate and said second transparent, said polarizing plates having respective absorption axes which are orthogonal to each other	90°	60° (not within range)
said absorption axes of said polarizing plates being angled with a range of ±40° to ±50° relative to a direction in which intermediate liquid crystal molecules are oriented, said direction indicating a direction of orientation of said liquid crystal in an intermediate	0°/90° (not within range)	15°/75° (not within range)

EXHIBIT 3

portion in a direction of thickness of said liquid crystal device;		
. . .		

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EXHIBIT 3